

## CLAIMS

1. An optical device comprising an input polariser (4) for passing light having a first polarisation direction,  
5 (11) a polarisation modifying element (5) for receiving light of the first polarisation direction from the input polariser (4), and an output polariser (7) for analysing light from the polarisation modifying element (5), the polarisation modifying element (5), comprising at least  
10 first and second sets of regions (8,9), the or each region (8) of the first set changing the polarisation of light from the input polariser (4) to a second polarisation direction different from the first polarisation direction and the or each region (9) of the second set supplying  
15 light of a third polarisation direction different from the second polarisation direction, characterised in that the output polariser (7) cooperates with the polarisation modifying element (5) such that each first light path through the or each region (8) of the first set and the  
20 output polariser (7) has substantially the same attenuation and phase change to light from the input polariser (4) as each second light path through the or each region (9) of the second set and the output polariser (7).

2. A device as claimed in claim 1, characterised in that the regions (8,9) of the first and second sets are interleaved and comprise first and second parallel strips,  
5 respectively.
3. A device as claimed in claim 2, characterised in that the first strips (8) have a first width and the second strips (9) have a second width greater than the first width.  
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4. A device as claimed in any one of the preceding claims, characterised in that the second and third polarisation directions are substantially orthogonal.
- 15 5. A device as claimed in any one of the preceding claims, characterised in that the third polarisation direction is the same as the first polarisation direction.
6. A device as claimed in any one of the preceding claims,  
20 characterised by having an alternative mode of operation in which the output polariser (7) is arranged to pass light from the regions (8) of one of the first and second sets and to attenuate light from the regions (9) of the other of the first and second sets.

7. A device as claimed in claim 6, characterised in that the one of the first and second sets is the first set.

5 8. A device as claimed in claim 6 or 7, characterised in that the output polariser (7) is arranged substantially to block light from the other (9) of the first and second sets in the alternative mode.

10 9. A device as claimed in any one of the preceding claims, characterised in that the polarisation modifying element (5) comprises a patterned retarder and the output polariser (7) is arranged to transmit the same proportions of slow and fast axis components of light from the first and second  
15 sets of regions (8,9).

10. A device as claimed in claim 9, characterised in that the output polariser (7) is arranged to transmit only the slow axis component of light from the first and second  
20 sets of regions (8,9).

11. A device as claimed in claim 9 or 10, characterised in that the retarder (5) comprises a photo-polymerised polymer.

12. A device as claimed in any one of claims 9 to 11, characterised in that the retarder (5) provides a half wave of retardation at a visible light frequency.

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13. A device as claimed in claim 12, characterised in that the slow axis of the or each region (8) of the first set is oriented at 45° to the first polarisation direction and the slow axis of the or each region (9) of the second 10 set is parallel to the first polarisation direction.

14. A device as claimed in claim 13, characterised in that the output polariser (7) transmits light having a polarisation direction oriented at 45° to the first 15 polarisation direction.

15. A device as claimed in claim 14 when dependent on claim 8, characterised in that the output polariser (7) is reorientable for the alternative mode so as to transmit 20 light having a polarisation direction substantially orthogonal to the first polarisation direction.

16. A device as claimed in claim 12, characterised in that the slow axis of the or each region (8) of the first set

is oriented at 22.5° to the first polarisation direction and the slow axis of the or each region (9) of the second set is oriented at -22.5° to the first polarisation direction.

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17. A device as claimed in claim 12, characterised in that the slow axis of the or each region (8) of the first set is parallel to the first polarisation direction and the slow axis of the or each region (9) of the second set is 10 oriented at 45° to the first polarisation direction.

18. A device as claimed in any one of the preceding claims, characterised by comprising a further polarisation modifying element (25) between the input and the output 15 polarisers.

19. A device as claimed in claim 18, characterised in that the further element (25) is a further retarder.

20. A device as claimed in claim 19, characterised in that the further retarder (25) provides a half wave of retardation at a visible light frequency.

21. A device as claimed in claim 20, characterised in that

the further retarder (25) is a liquid crystal device.

22. A device as claimed in claim 20 or 21 when dependent on claim 13, characterised in that the further retarder 5 (25) has a slow axis oriented at 22.5° to the first polarisation direction.

23. A device as claimed in claim 22, characterised in that the output polariser (7) transmits light having a 10 polarisation direction parallel to the first polarisation direction.

24. A device as claimed in claim 23 when dependent on claim 8, characterised in that the further retarder (25) and 15 the output polariser (7) are rotatable as a unit through 180° about an axis parallel to the slow axis of the or each region (8) of the first set for the alternative mode.

25. A device as claimed in claim 21, characterised in that 20 the further retarder (25) comprises at least one region whose slow axis is switchable between a first orientation substantially parallel to the first and second light paths and a second orientation substantially perpendicular to the first orientation.

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26. A device as claimed in claim 25, characterised in that the further retarder (25) is a Freedericksz cell.

5    27. A device as claimed in claim 25 or 26 when dependent on claims 13 and 8, characterised in that the first orientation is for the alternative mode, the second orientation is oriented at 22.5° to the first polarisation direction, and the output polariser (7) transmits light  
10 having a polarisation direction perpendicular to the first polarisation direction.

28. A device as claimed in claim 25 or 26 when dependent on claims 16 and 18, characterised in that the second  
15 orientation is for the alternative mode and is oriented at 67.5° to the first polarisation direction and the output polariser (7) transmits light having a polarisation direction perpendicular to the first polarisation direction.

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29. A device as claimed in claim 25 or 26 when dependent on claims 17 and 8, characterised in that the second orientation is for the alternative mode and is oriented at 22.5° to the first polarisation direction and the output

polariser (7) transmits light having a polarisation direction oriented at 45° to the first polarisation direction.

5 30. A device as claimed in claim 20 or 21, characterised in that the further retarder (25) comprises at least one region whose slow axis is switchable between third and fourth orientations substantially perpendicular to the first and second light paths.

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31. A device as claimed in claim 30 when dependent on claims 16 and 8, characterised in that the third orientation is perpendicular to the first polarisation direction and the fourth orientation is for the alternative mode and is 15 oriented at 67.5° to the first polarisation direction.

32. A device as claimed in claim 18, characterised in that the further element (25) is a polarisation rotator.

20 33. A device as claimed in claim 32 when dependent on claim 13, characterised in that the rotator (25) comprises at least one region which provides a polarisation rotation of 45°.

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34. A device as claimed in claim 33, characterised in that the rotator (25) comprises a twisted nematic liquid crystal device.

5   35. A device as claimed in claim 34, characterised in that the liquid crystal device (25) has an alignment direction (50), at a liquid crystal surface nearer the input polariser (4), parallel to the first polarisation direction and an alignment direction (51), at a liquid crystal surface 10 nearer the output polariser (7), oriented at 45° to the first polarisation direction.

36. A device as claimed in claim 34, characterised in that the liquid crystal device (25) has an alignment direction 15 (50), at a liquid crystal surface nearer the input polariser (4), oriented at 22.5° to the first polarisation direction and an alignment direction (51), at a liquid crystal surface nearer the output polariser (7), oriented at 112.5° to the first polarisation direction.

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37. A device as claimed in claim 34, characterised in that the liquid crystal device (25) has an alignment direction (50), at a liquid crystal surface nearer the input polariser (4), oriented at 12.5° to the first polarisation direction

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and an alignment direction (51), at a liquid crystal surface nearer the output polariser (7), oriented at 102.5° to the first polarisation direction.

5 38. A device as claimed in any one of claims 32 to 37 when dependent on claim 8, characterised in that the polarisation rotator (25) is disableable for the alternative mode.

10 39. A display characterised by comprising a device as claimed in any one of the preceding claims.

40. A display as claimed in claim 39, characterised by comprising a spatial light modulator (2).

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41. A display as claimed in claim 40, characterised in that the modulator (2) is a liquid crystal spatial light modulator.

20 42. A display as claimed in any one of claims 39 to 41, characterised by having an autostereoscopic mode.

43. A display as claimed in claim 42 when dependent on claim 8, characterised in that the device (25) when in

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the alternative mode forms a front or rear parallax barrier.